The Partnership of Electricity Storage and Distributed Generation

"Creating an Expanded DER Industry"

SAFT

Distributed Generation

- ***"Transmission reliability, distributed resources and energy storage… will contribute to the development of the dynamic power grid of the future, characterized by distributed intelligence, distributed generation, and distributed storage."***

  Imre Gyuk, Energy Storage Program Manager, U.S. Department of Energy

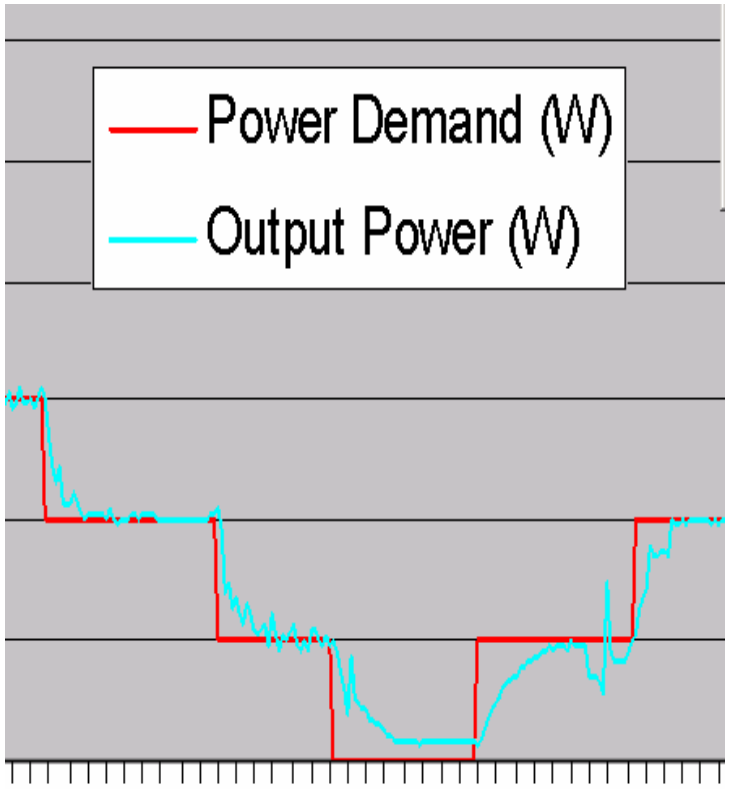
- ***"Energy storage can often augment DG in three ways… for stabilization purposes… [to] provide energy to ride through periods when the DG unit is unavailable… [and to] permit a non-dispatchable DG unit to operate as a dispatchable unit."***

  H. Lee Willis, Walter G. Scott, "Distributed Power Generation: Planning and Evaluation"

- **DG types to be discussed**
  - **Microturbines**
  - **Residential fuel cell generators**

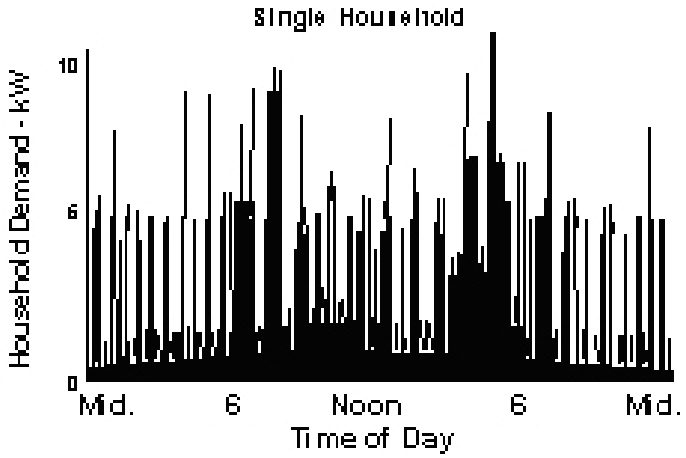
Microturbines

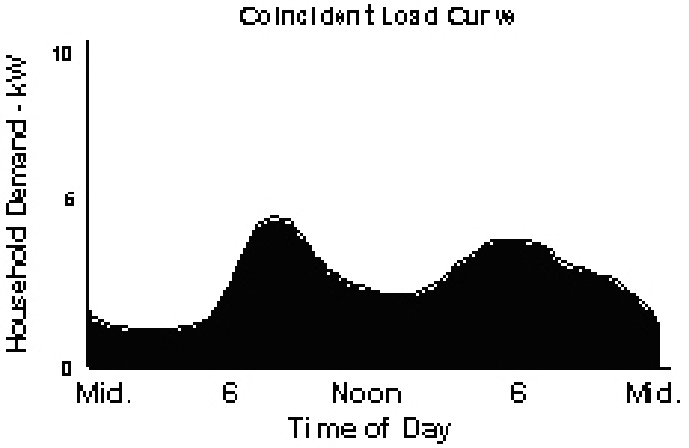
- 25 – 250 kW output
- Majority of installed base is Capstone 30 kW unit
  - 800 out of 1200 units shipped in 2000
  - 300 75 kW units from Honeywell
- High efficiency, but slow response time
  - Approx. 15-second ramping time
  - Requires energy storage for off-grid operation
- Other uses for energy storage
  - Motor starts
  - Black starting microturbine
  - Ridethrough during microturbine start



Residential Fuel Cell Generators

- Being developed by several companies
  - Mostly PEM fuel cells
- Generator supplying single household sees non-coincident load behavior
  - Not economic to base fuel cell output on peak loads
- Generator output sized for base load
- Energy storage supplies peaks
- Energy storage also used for black starts





Distributed Generation Energy Storage Requirements

- Both microturbines and fuel cell generators benefit from energy storage
- Energy storage characteristics
  - Peak power capability in 10's of kW
  - Total energy delivered <1 kWh
  - 10s of cycles per day
- Other requirements
  - Long life
  - Low life cycle cost
  - Temperature extremes?
  - Small volume?
- These needs are not met by today's batteries!

High Power Storage Technologies

- **Batteries**
  - Lithium ion
  - Nickel-metal hydride
- **Non-battery technologies**
  - Supercapacitors
  - Flywheels
  - SMES
- **Saft's emphasis is on lithium ion and supercapacitors**
  - DoE-funded project for lithium ion system

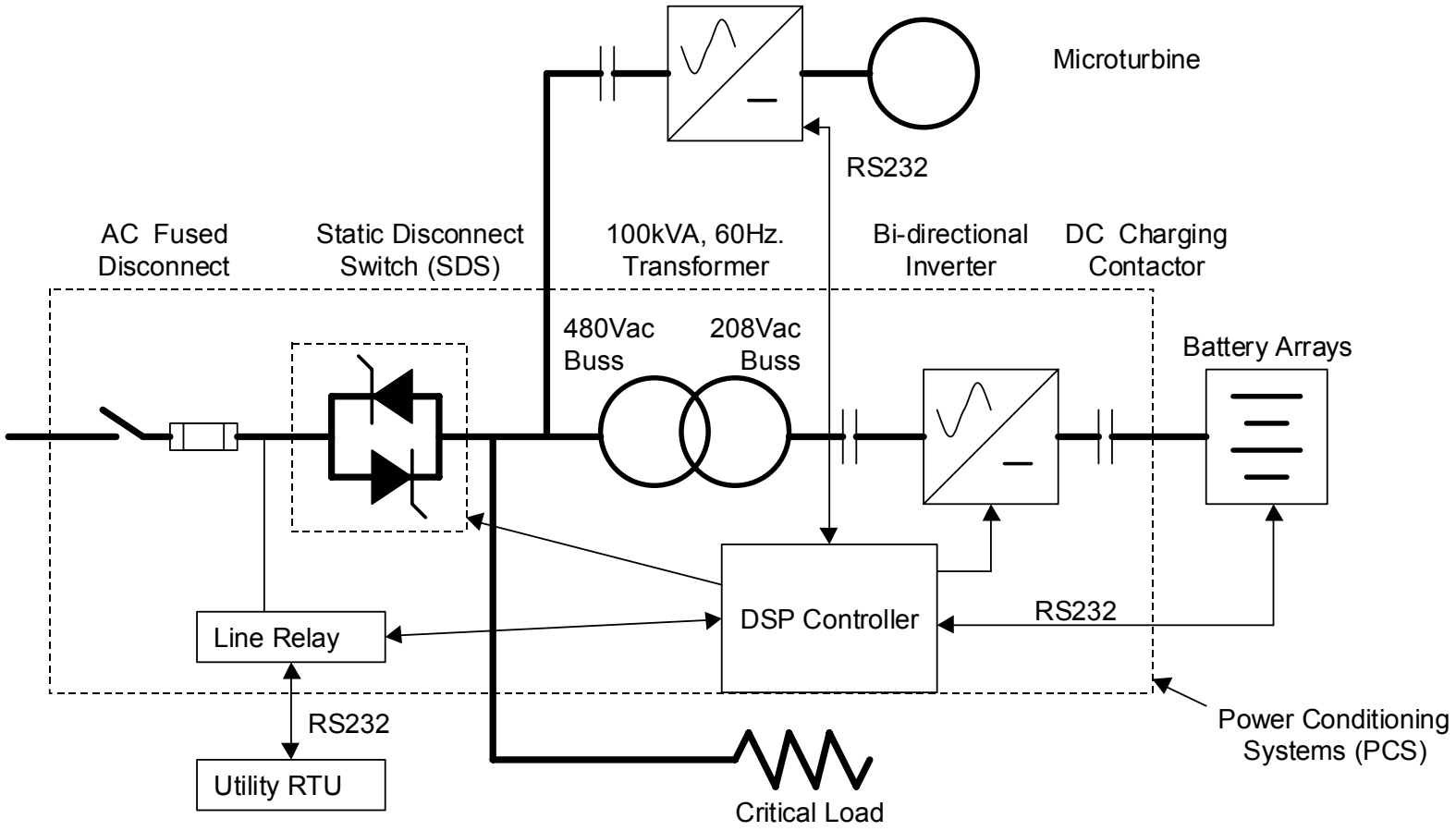
Project Participants / Components

- Saft 14kWh high power lithium ion battery
  - 150kW / 10 sec
  - 100kW / 1 min
  - 60kW / 2+ min
- SatCon 100kVA / 100kW power conditioning system
  - IGBT-based
- Dominion Virginia Power providing testing and eventual customer installation
- Project funded by DoE and managed by Sandia
- System arrives at Dominion facility in May 2002

System Overview

- Two operating modes
- 100kVA power quality system
  - Running in offline UPS mode
- Operation in conjunction with a 60kW Capstone microturbine
  - Line linkage mode (grid export)
  - Standalone mode
  - Automatic transition between two modes

Configuration



Importance of DoE Funding

- Many technologies identified for electrical energy storage are developed, but not yet commercialized
- Demonstration systems are a major way to validate product claims and generate interest in additional systems
- DoE funding for the Energy Storage Systems program has produced a large number of such projects
- Many demonstration systems have evolved into commercially viable products
- Many of these products will enhance the capabilities of DG systems

To Learn More…

Visit the Electricity Storage Association website -

ELECTRICITY STORAGE ASSOCIATION

www.electricitystorage.org